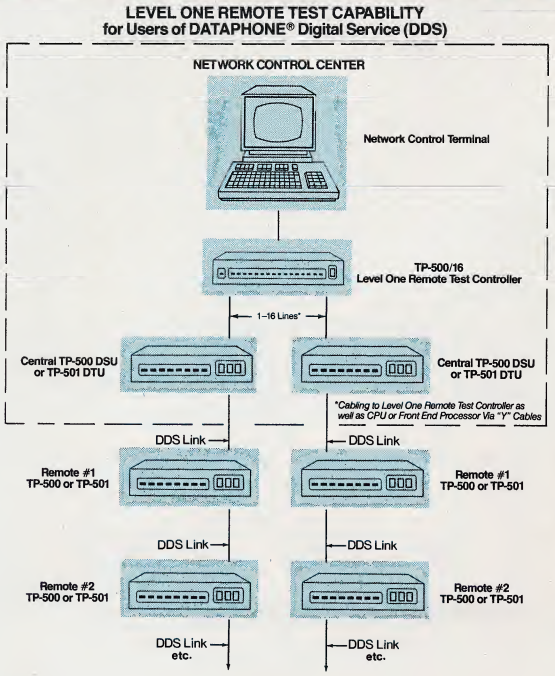
INDUSTRYWEEK
PENTON/IPC
THE BUSINESS MANAGEMENT MAGAZINE

SPECIAL ADVERTISING SECTION ~ SEPT. 17, 1984

ENHANCING THE NETWORK

Ideas for Improving the Performance and Lowering the Cost of Data Communications



Typical network diagram indicates network control configuration for multidrop subrate (2400–9600 bps) network. Point-to-point and/or wideband (56 kbps) networks would be similar with respect to controller interface.

Does going to DDS mean giving up remote diagnostics?

It did up until May 8, 1984, when we formally announced our Level One Remote Test and Diagnostics Capability. It's fully debugged and commercially available for delivery right now . . today. Level One Remote Diagnostic and Test Capability includes remote control of DDS loopback, remote control of DTE loopback, automatic antistreaming, remote status display, pattern generation, bit error rate testing, and central-site control of external equipment at the remote sites. Level One is an interfering test and requires taking down the link during testing which makes it fine for a small network. If you have a large network, we haven't forgotten you; very soon we'll announce the availability of Level Two and Level Three noninterfering remote test and diagnostic capabilities. If you'd like more information, please circle readers' service number 1.

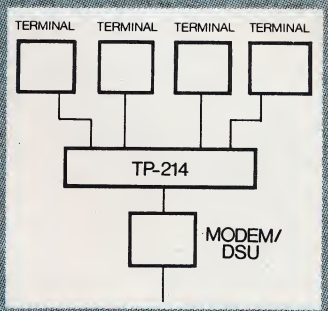
Modem sharing makes sense

When you add terminals in a multidrop polled network, you can often save cost by sharing a modem among two or more terminals at the same site. Our TP-2/4 Interface Sharing Unit lets up to four terminals share one modem. Even better, our TP-2/8, which is an expandable sharing unit, lets you share up to eight terminals per modem, lets you locate terminals up to 2000 feet from the sharing unit, and provides antistreaming capability. The TP-2/8 may also function as a contention device when remote terminals are vying for the line. If you'd like information on the TP-2/4, circle readers' service number 2. If you'd like information on the TP-2/8, circle readers' service number 3.

All those little boxes can be a pain in the neck

We know what it's like when you go to DDS with all its wonderful advantages. You end up with a lot of little boxes called CSUs and DSUs cluttering up your central and remote sites. Well, we just cut the problem in half by combining the CSU and DSU in the same little box. At the central site, we've made an even more dramatic space saving by designing rack-mounted combination CSU/DSU units that take up less than one third of the space required for separate Bell system equipment. Our TP-501 CSU/DSU equipment has externally selectable subrate speeds of 2400, 4800, and 9600 bps plus a lot of other neat features including built-in Level One Remote Test Capability. For more information circle readers' service number 4.

Sometimes one data link can do the work of four



The secret lies in using the line efficiently. Our TP-214, four-channel Stat Mux lets you connect four asynchronous terminals to a synchronous modem; to one or more ports of a multiport synchronous modem; or to a DSU. As a result, you get four asynchronous data paths over a single 2400 bps data link. The TP-214 blocks input data and ensures correct reception of each block by means of a sixteen-bit frame check sequence. It has front panel diagnostics and remote test capabilities. For more detailed information circle readers' service number 5.

TeleProcessing Products, Inc., designs, manufactures, and markets an extensive family of products that improve the performance and lower the cost of data communications. For full information on the company and an overview of the product family, circle readers' service number 6.

TeleProcessing Products, Inc.

4565 E. Industrial St., Bldg. 7K, Simi Valley, CA 93063 (805) 522-8147

PREPARED FOR INDUSTRY WEEK BY INTERNATIONAL DATA CORPORATION

The Divestiture.
Suddenly it's a whole new world. We've been plucked out of one environment and plopped into another—and few of the coping mechanisms that worked before are appropriate anymore.

We will each keep afloat according to our needs—and means. From a flotilla of equipment and service alternatives managers must

choose the ones that best suit their organizations—not just for now but for a future that promises still more change.

This third White Paper to Management, prepared for INDUSTRY WEEK by International Data Corporation, tracks The Divestiture's tough times and telescopes in on the rich bounty of alternatives it is unleashing as we begin our travels down a new evolutionary path.

BREAK UP, BREAK DOWN

Theoreticians will tell us that three techniques have been used to evolve a competitive telecommunications environment: divestiture, equal access, and access charges. But what looks neat in principle can get muddied in implementation.

Where once was Ma Bell there are now:

- Seven regional holding companies charged with providing local loop communications services and mostly regulated by state public utility commissions. These range in revenue size from $7 billion to $10 billion, and carry assets valued at roughly double their revenues. The RHCs are empowered to form their own subsidiaries to market—but not manufacture—equipment.
- And AT&T, $57 billion strong with assets of only $34 billion. AT&T Communications, still regulated, handles long distance communications. AT&T Information Systems is a competitor in computer and communications equipment.

Distributed Blame

Users can tell the post-Divestiture difference quickest from their phone bills, which are approaching the size of phone directories. There are separate billings for local service, for equipment, for long distance service.

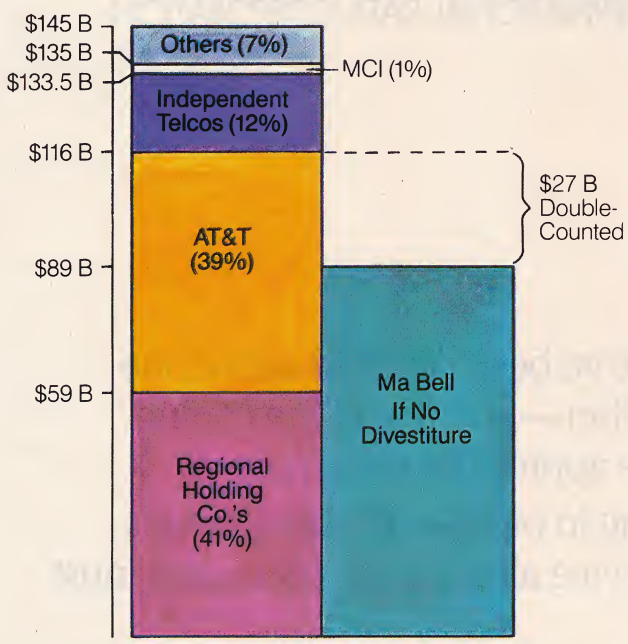
This is the most visible effect of the end of end-to-end service. National and international companies no longer have a single contact at the phone company. No one seems to know who's responsible for network problems; no one—including Bell personnel—seems to know what number to call to get things done.

Equal access is easier said than done. "Since the divestiture, getting lines and service connections from both the operating companies and AT&T has become a nightmare," bemoans Larry Crain, vice president of corporate planning at Republic Telecom.

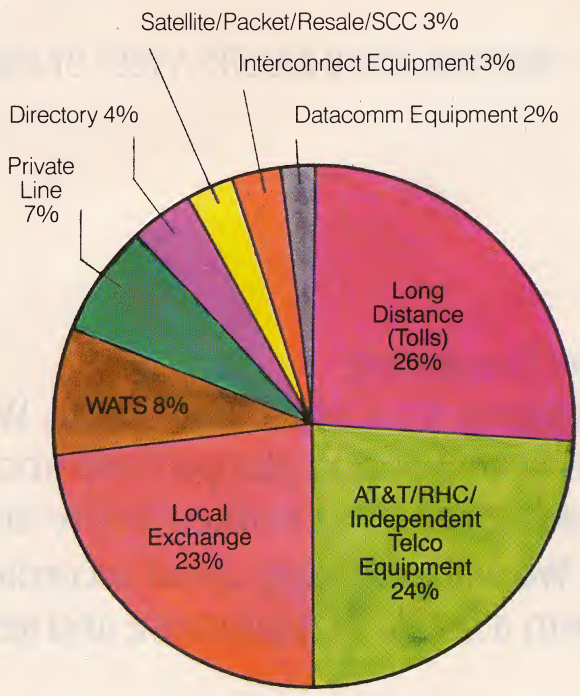
Moreover, lines have been disconnected without orders, and bills have been sent for nonexistent and unrequested lines. The backlog of orders at AT&T Communications for private lines exploded to 28,200 at the end of April, double the previous month.

THE U.S. TELEPHONY MARKET TRANSFORMED

Source: International Data Corporation



1984 Market By Provider
$145 Billion



1984 Market By Service
$145 Billion

When AT&T was broken up last January, the size of the market instantly grew by nearly 20%—some $27 billion that AT&T and the regional holding companies pay themselves now gets counted twice.

And although the basic components of service are mostly the same as "Before," AT&T has been relegated to a minority role and is now a mere 39 times the size of its nearest nonmonopoly competitor, MCI.

HEROIC STRIDES MADE IN NETWORKING.

All networking needs are not created equal. Just like all organizations. At MDS, communications networks are our specialty. And our approach is unique.

MDS doesn't ask that your system conform to our hardware or software. Instead, we consult to define your needs. Then, we devise a system...just for you.

MDS HEROISM MAKES YOUR NETWORK WORK.

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YOUR NETWORK NEEDS THE RIGHT CONNECTIONS.

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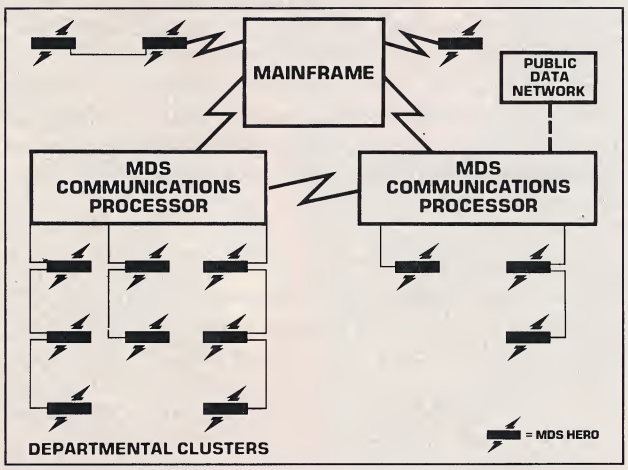

INTELLIGENT 3270™ from MDS permits programs written on the MDS HERO Networked PC to access your mainframe database, retrieve information, update it, automatically integrate it into existing programs, then return it to the mainframe or store it locally. Information you couldn't reach before is now instantly available at the workstation.

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MDS

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FOR INFORMATION, CIRCLE NO. 12

Only about 20% of private line orders are being filled on schedule.

The fee for lines accessing local operating companies' central office switches, which is supposed to affect residential and business users alike, has been applied only to multiline users. Some attribute several postponements to election-year politics.

But billions of dollars worth of rate requests haven't been dealt with yet by state utility commissions. And AT&T Communications got the FCC to drop its long distance rates about 6%—rather than the 10% it wanted. Obviously, phone rates will be up for grabs for a long time to come.

Re-orienteering

With such a gap between action and intent, it's easy to sympathize with those who might lose their sense of direction. The regional holding companies, eager to spin off new businesses such as marketing customer premise equipment and nonentertainment cable TV, were perhaps the first to be distracted from their first purpose.

In July, the federal judge who oversaw The Divestiture reminded the seven RHCs that their primary business is the provision of local loop communications. The judge rejected one RHC request to launch a long distance network as part of a potential NASA contract.

Still, the local operating companies did well in the first quarter, indicating that they're not suffering yet from The Divestiture. They're enjoying carrier fees from AT&T, the long distance companies, and large business customers—in addition to local service rate increases.

AT&T Information Systems, meanwhile, has been ushering out all kinds of new products. In March, it went into the data processing business with a line of Unix-based, multi-user, multi-tasking computers, an MS DOS interface, and a network to link it all together with integrated voice/data communications systems announced earlier.

THE USERS' QUANDARY

Communications billing is a nightmare. Budgeting is nigh unto impossible. The fella at the phone company who always smoothed the way before has disappeared like Zorro into the desert. And dozens of salesman from equipment manufacturers, interconnect firms, the local operating companies, and even AT&T are banging on the door.

Now what?

It behooves users to ask some questions about their own communications resource. How does it operate? How much does upkeep cost? How often are repairs needed? How many telephones? How many outside lines? Remarkably, most companies don't have answers to such queries.

More Money

In all the confusion, one thing at least is crystal clear: communications will cost more. Many firms have upped their phone budgets to accommodate rate hikes, praying that it'll be enough, since *no one* knows the global effects of so many decisions by so many regulating bodies. It will take a year or more for companies to figure out the effects of rate changes on their operations.

More People

Controlling communications costs requires help—in tracking expenses and in figuring out new ways to cut them.

Some organizations have hired staff to act as vendor contacts, clerks to reconcile bills with actual usage and equipment inventory, programmers to rewrite charge-back programs now that AT&T bills for gear once invoiced by the operating companies.

International Data Corporation has found that its user clients are eager for telecommunications experts to work in MIS/data processing departments.

IN THEIR OWN DEFENSE, BARRISTERS CHOOSE PBX

Any attorney will confess to talking alot. Theirs is the business of words, written and spoken. But managing the spoken word can be tough—especially when it comes to charging clients for advice delivered over the telephone.

Attorney Edward Hester, who practices law in California with three colleagues, found a solution to his talking problem—a microprocessor-based hybrid PBX system.

Now that low-end PBXs are also low-priced, even small businesses can afford them. And Hester, who bought an Opus 20 from Thomson CSF Communications, can afford to keep talking.

Hester's microprocessor-controlled, multiline system accommodates three

kinds of phones—including self-diagnosis, automatic dialing, an answering machine, call tracking features, and a hands-free speakerphone that Hester particularly likes.

"An attorney's desk is usually full of papers," he comments. "If I have to do a lot of shuffling around, it can become very aggravating when I also have to worry about cradling a handset on my shoulder."

And the SMDR printer the attorneys will be adding soon will allow them to accurately bill clients for phone consultations. Any bets as to how many words it'll take Opus 20 to pay for itself?

A profitable combination

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FOR INFORMATION, CIRCLE NO. 17

More Decisions

The Divestiture is a consultant's delight. Network analyses and engineering studies are being conducted by users so they can intelligently consider the telecommunications alternatives. After all, cost-justifying a network changes as rates do, and phone equipment deregulation means more to choose from.

Bigger phone bills might be The Divestiture's first effect—but it has also created unparalleled opportunities to cut costs with new equipment and previously unorthodox transmission techniques. Local area networks, office automation, shared private networks, teleconferencing—all these approaches and others must be examined and selected from a new financial perspective.

"The days of monopoly are all over. The days of one company having all the right answers are over," emphasizes Paul Lee, president of Interline, an RHC subsidiary with offices in 30 cities across the country that consults on telecommunications systems installation, maintenance, and engineering.

More Management

Without Ma Bell to determine everyone's fate, corporate telecommunications has become a do-it-yourself operation. More money, more people, and more decisions inevitably mean more management at higher organizational levels.

There's not only cost control to consider. There's planning: The burgeoning multitude of alternatives to local loop and long distance communications are laid out in the pages that follow; no matter which ones a company opts for, the effect on its structure will be profound and must be anticipated as much as possible.

Often that means reorganization; should telecommunications be delivered unto the MIS function, should it stand alone, should it be run by committee? Whatever the answer, a firm's communications resource should command attention at the very highest executive levels in this moment of change. What happens at the top will go a long way in determining what happens at the bottom line.

THE DIGITAL DEMANDS OF OFFICE AND FACTORY AUTOMATION

The vast bulk of business communications is conducted with the human voice, usually over the telephone. But the computer's role in business continues to grow larger and larger as computing devices get smaller and smarter and cheaper.

"The microcomputer has become an integral part of the total business communications question," says John Roach, CEO and chairman of the board of Tandy Corp., makers of Radio Shack personal computers. "For sure, computer-aided business communications of the future will be a great productivity enhancer as telephone tag and paper correspondence is reduced. The result will be fewer clerical support personnel and more productive managers."

Even in 1984, there are almost 24 million computing machines of various sorts operating in U.S. businesses—and almost 21 million of those have keyboards and are at the hands of individual workers.

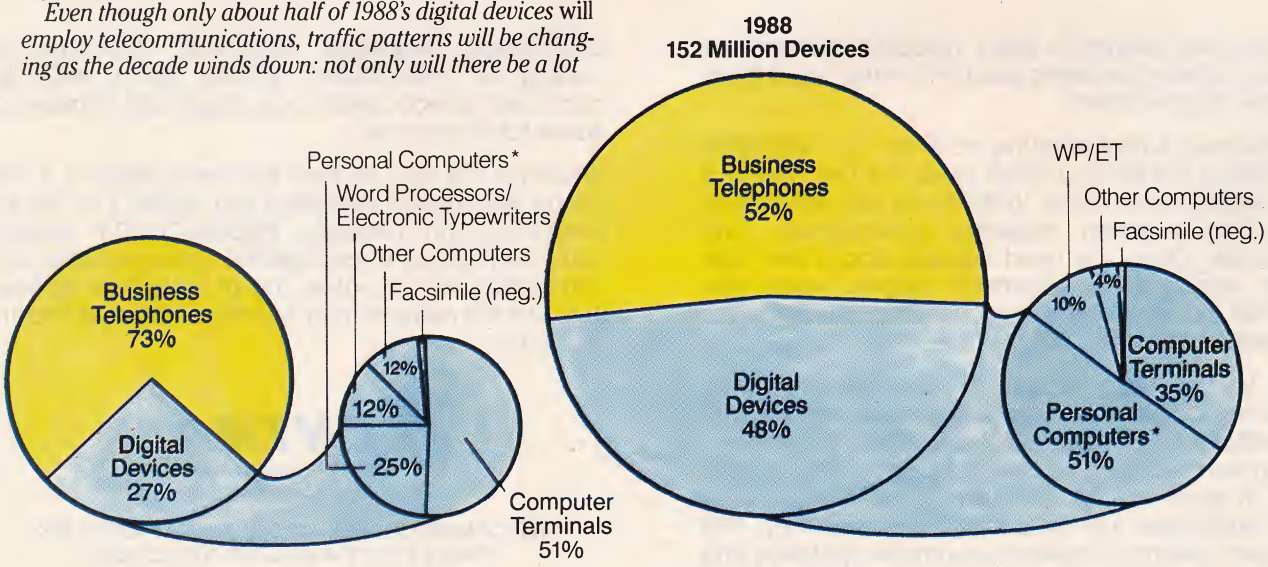
Although some are being networked, like the PC from Mohawk

A NETWORK NOBLESSE OBLIGE

(U.S. Installed Base of Devices: 1984 and 1988)

Analog-based voice transmission still dominates communications networks today, especially since most of 1984's digital devices don't actually use telecommunications.

Even though only about half of 1988's digital devices will *employ telecommunications, traffic patterns will be changing as the decade winds down: not only will there be a lot more gear equipped to communicate, but a great many of them will be personal computers linked to mainframes and other digital machines.*



Source: International Data Corporation

*Business and Scientific PCs Only

Data Sciences, most of those machines do not communicate—but it's clear that as automation mandates are implemented for the sake of improved worker productivity, a great many of those machines *will* communicate.

By 1988, almost 73 million computing devices will be operating in the U.S. Some 70 million will have keyboards. Over 37 million will be personal computers.

Local Area Networks

An organization contemplating how its Babel of computers will communicate with each other will likely yearn for a single backbone that flexibly links resource stations, independent of size and type, in a limited geographic area (campus, building, or work area).

What they want is a local area network.

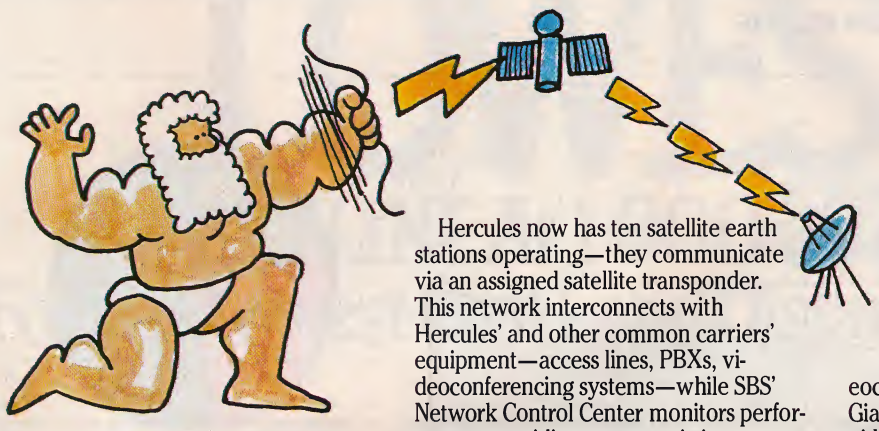
These days, LANs come in two types:

- Baseband, which uses either twisted pair or coaxial cable and is found mostly in office work areas.
- Broadband LANs are typically larger than baseband and more complex and costly, usually networking an entire facility, often in industrial/manufacturing environments.

The market for LANs has been limited by a couple of factors. Installation is expensive because buildings must be wired. Even more critical, vendors cannot agree to LAN standards; thus only the most daring of pioneers will install a LAN that might soon be incompatible with the standard.

Nevertheless, local area network technology offers a powerful solution to the ballooning problem of organizational data communications. Users can share resources like printers, disk drives,

A NETWORK COLOSSUS FOR HERCULES



"Management wanted to increase our business and improve information flow without increasing people...." That was the story in the recession-ridden early '80s at Hercules, Inc., a leading multinational chemical company.

The solution was not only automation, but a pioneering telecommunications network that Hercules president Alexander Giacco believes will save his company $10 million over five years.

"We picked Satellite Business Systems because we wanted a system that would integrate our voice, data, and image communication requirements into one transmission path," recalls Ross Watson, VP of information resources. All of the systems developed at Hercules'—voice messaging, electronic mail, and teleconferencing—have been incorporated into the same satellite network that handles long-distance telephone service and data communications.

Hercules now has ten satellite earth stations operating—they communicate via an assigned satellite transponder. This network interconnects with Hercules' and other common carriers' equipment—access lines, PBXs, videoconferencing systems—while SBS' Network Control Center monitors performance, providing usage statistics.

There's a lot to network:

The firm's data processing plant is huge. There's a data center at corporate headquarters in Wilmington, Delaware to which all earth stations are linked, as well as a large center in Utah and smaller ones in Canada, Mexico, and western Europe. The Wilmington center houses two IBM 308X mainframes and a regiment of peripherals; it supports over 1,000 terminals and a variety of communications protocols and data transmission speeds.

Hercules' voice messaging system presently boasts 2,500 users sending about 50,000 messages a month—about half the messages are local, the rest are handled by the SBS net.

The company operates 24 videoconferencing rooms at 17 sites, including one overseas. Plans are to upgrade from the present color still-frame mode to full-motion. Hercules' commitment to videoconferencing is deep. President Giacco, a user, likes it because it "provides shorter lines of communication between where the work is done and the plans are made."

Electronic mail at Hercules is just beginning. Using Wang word processing systems, 40 locations are signed on, mostly through terrestrial dial-up lines—they send 3,000 documents a week. Next move: routing electronic mail over the satellite network.

Hercules employees have become enthusiastic users of these automated systems, thanks to implementation that emphasized teamwork and extensive user training.

But the real key to Hercules' successful telecommunications efforts lies in the executive suite. As Ross Watson puts it, "Giacco has really been the top supporter. That lets us plan for what's best in the long term. In some companies, everything is strictly cost-displacement—Hercules' management perceives value added as well."

database management systems. A LAN can serve as a common interface between incompatible gear. Network management, error reporting, diagnostics, and fault isolation can all be centralized. LANs can even carry voice communications.

PBXs

Of course, we have telephones for that, and the wires are already laid. And we have switches that are not only sophisticated in handling voice traffic, but are now taking on data, too.

Private branch exchanges, we call them—PBXs.

They have evolved with their technology and are fast becoming the office gateway, linking voice and data networks with a multitude of local loop and long haul transmission services.

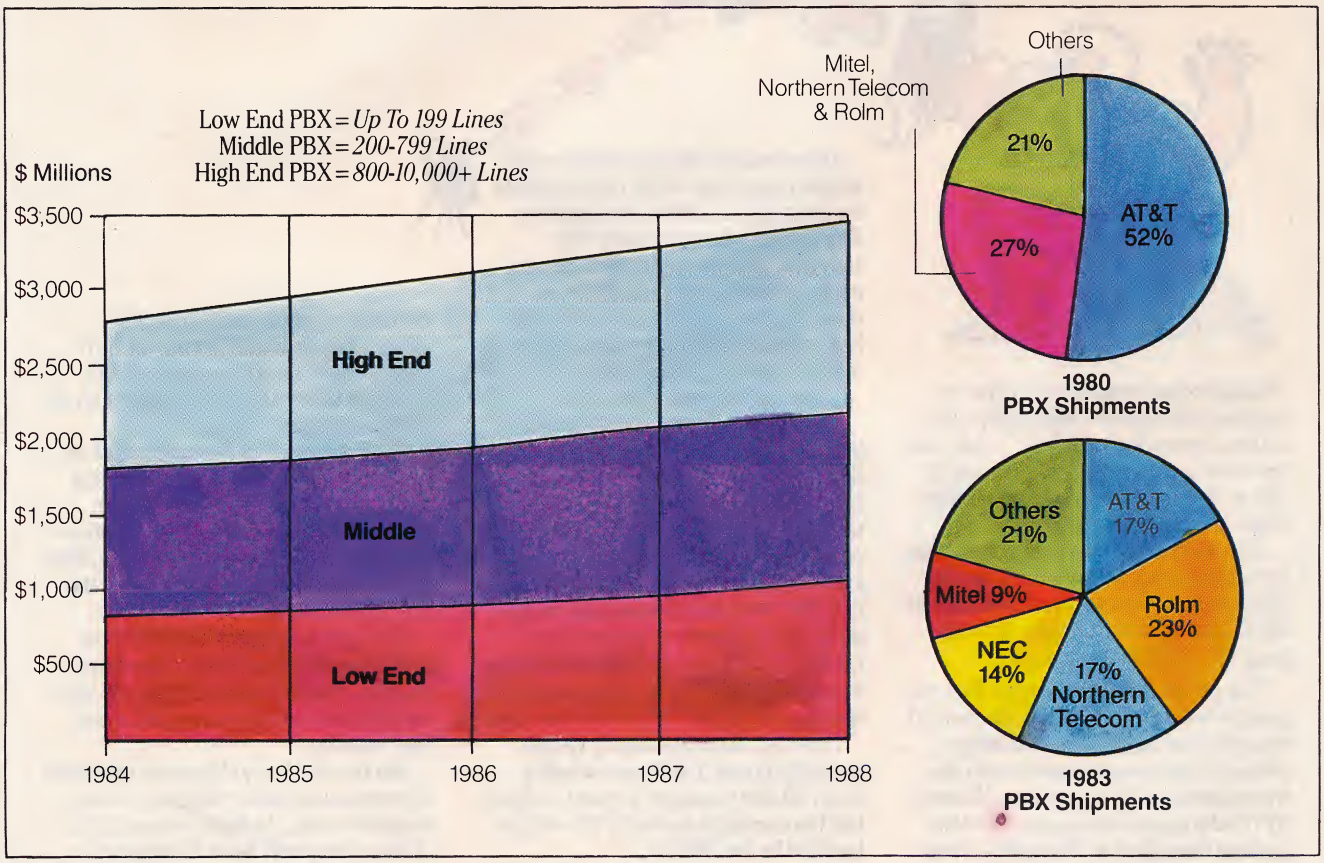
The advanced, fourth generation PBX systems, which boast distributed architecture and digital-based circuit- and packet-switching functions, even include integrated LAN capabilities. Vendors with such PBX products include CXC, Ztel, Rolm, Intecom, Northern Telecom, NEC.

It's hardly coincidental that this new role for the PBX parallels The Divestiture. Indeed, the breakup of AT&T has created new market opportunities for PBX vendors:

- The now liberated regional holding companies are signing marketing agreements with vendors other than AT&T, resulting in a precipitous decline in AT&T's share of PBX shipments—from 52% in 1980 to only 17% in 1983.
- The FCC's local access charge policies—wherein all lines entering a local operating company's central office switch would be charged a monthly access fee—favor PBX users over Centrex users. PBX systems bundle up to 15 individual phone lines into one direct access line that feeds into the central switch; but Centrex users' phones each have direct line access to central switches. Not surprisingly, lots of Centrex users are exploring the PBX alternative.

COMPETITION CARVES OUT A NEW PBX PIE

(U.S. Market Shipments, 1984–1988)



Growth in the PBX market is occurring at both the low and high ends. Low end expansion is being fueled by low-cost, easy-to-install systems aimed at small offices. Downright dramatic is the growth at the high end, thanks to migration of Centrex users to PBX alternatives as well as demand for large-scale PBXs in shared tenant communications systems.

Meanwhile, AT&T is fast losing PBX market share. While it can still claim better than half of the PBX installed base in 1983 (measured in lines), AT&T's shipments represent only a 17% market share, down from a 37% share in 1982.

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SKYLINE ADVANTAGE OVER COMPETITION
(Comparison of 4 typical monthly phone bills**)

	AT&T	MCI	SPRINT	SKYLINE
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** Based upon charges for calls at 1-10 minutes duration to a sampling of 20 Skyline cities between 8AM and 5PM weekdays. Comparisan ta ather carriers' charges based an tariffs an file with the FCC and in effect as of 7/15/84.

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It's in precisely those PBX markets that'll see the most growth where the most danger lurks. The next few years will see a shakeout among PBX vendors as competitive pressures mount.

That's why so many have either become involved in mergers/acquisitions—IBM and Rolm, Wang and Intecom, AT&T and Olivetti, Ericsson and Honeywell, Plessey and Stromberg-Carlson, ITT and CXC—or have sought opportunities in specialized niche markets.

A MATTER OF MOVING DATA

Because the nation's telephone plant is designed for the human voice and not computer-generated data, there's all kinds of products and services whose aim is to assist digital signals in traveling the analog phone system.

Data Communications Equipment

U.S. suppliers of data communications equipment will claim revenues of almost $3 billion by yearend 1984 for the gear they ship worldwide. Data comm's "black boxes" come in three styles.

Modems. These handle *mo*dulation and *demo*dulation of digital signals into analog ones that can be moved over telephone lines, and check for errors, perform diagnostics, and provide autodialing. Modems represent nearly half of data communications equipment sales, according to market estimates by International Data Corporation.

In the 1980s, modem suppliers like Hayes Microcomputer Products have developed offerings for minicomputers and personal computers.

Multiplexers. If several slow-speed devices could share a single high-speed line, there's savings. Multiplexers collect signals from a number of machines before sending the signals over phone lines. More advanced multiplexers also assume that not all devices communicate at the same time, so they cut down the number of output lines. A new market for T1 Carrier multiplexers is starting to emerge, too, involving manufacturers like General Datacomm and Timeplex and resellers such as Digital Equipment Corp.

Multiplexers are being shipped faster than any other kind of data communications equipment, believes International Data Corporation. Nearly 25% of 1984 shipments, they constituted only 13% in 1980.

Network Processors. Once signals are in the net, network processors switch them. Concentrators, such as the Micro800/2 from Micom Systems, use sophisticated software routines to compress data so more devices can share a single line. Other processors manage incoming calls for computer systems. These devices claim over a third of U.S. data communications suppliers' shipment dollars.

Data Communications Software

Independent software producers will pull in over $100 million by yearend from sales of software packages that perform data communications functions—when the data communications software revenues of hardware manufacturers are added in, that figure more than doubles.

By 1988, independents will see revenues of nearly $600 million; research by International Data Corporation indicates that data communications software is one of the fastest growing sectors in the software industry.

Most of these products are designed for larger mainframe and medium-scale computer systems. Access method software handles data transfer between the processor and its peripherals. Teleprocessing software oversees simple data entry functions or a single remote terminal. Timesharing software allows many users equivalent access to a single computer. Teleprocessing monitors offer a complete support environment for many different but interacting users of a single computer.

But for all this variety, none of these kinds of software can handle communications between personal computers and main-

TIME AND TIME AGAIN THE ANSWER IS E-MAIL

Despite user dissatisfaction with expensive information systems, it took Time, Inc., awhile to put microcomputers to work in its corporate manufacturing and distribution division, which spends almost half a billion dollars a year to print and distribute such magazines as *Time*, *People*, *Discover*, and *Life*.

Finally, in 1983, the division installed IBM personal computers, foregoing costly timesharing services. Using off-the-shelf software, the PCs handle a dozen different applications.

Essential to a smooth PC-based operation is an international electronic mail network.

Boasting significant cost advantages over telex and facsimile transmissions, the division's electronic mail network uses Hayes Microcomputer's Smartmodem 1200s and Microstuf's Crosstalk terminal emulation software to transfer data files between mainframes and micros via GTE Telenet's Telemail service.

The electronic mail net is popular, thanks to an emphasis on training—for every $6 spent on hardware, $1 has been spent on user training.

But the division's E-mail is embryonic. Future directions lean toward local area networks to connect computers, printers, plotters as soon as Time can answer questions about how LANs will evolve.

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LINKING COMPUTERS & COMMUNICATIONS

FOR INFORMATION, CIRCLE NO. 13

frames—which, of course, is what everybody wants. For that, a couple of different approaches have been developed:

• **Terminal emulation software** came first. Since the machine architecture of PCs is different from those of mainframes, the software disguises the PC as a terminal that the mainframe already knows how to communicate with.

In 1984, terminal emulation software vendors racked up sales of roughly $20 million, according to market researcher Susan E. Messenheimer, consultant to Venture Development Corp. By 1988, sales will reach $150 million, she estimates.

• **Micro-mainframe links** handle at least some of the tasks left undone by the emulators. They can translate mainframe file structures into PC file structures. Some use a friendly query language so that particular files—even fields and records—can be specified for downloading.

1984 vendor revenues from micro-mainframe links, says Messenheimer, will stand around $10 million, while 1988 sales will approach $700 million.

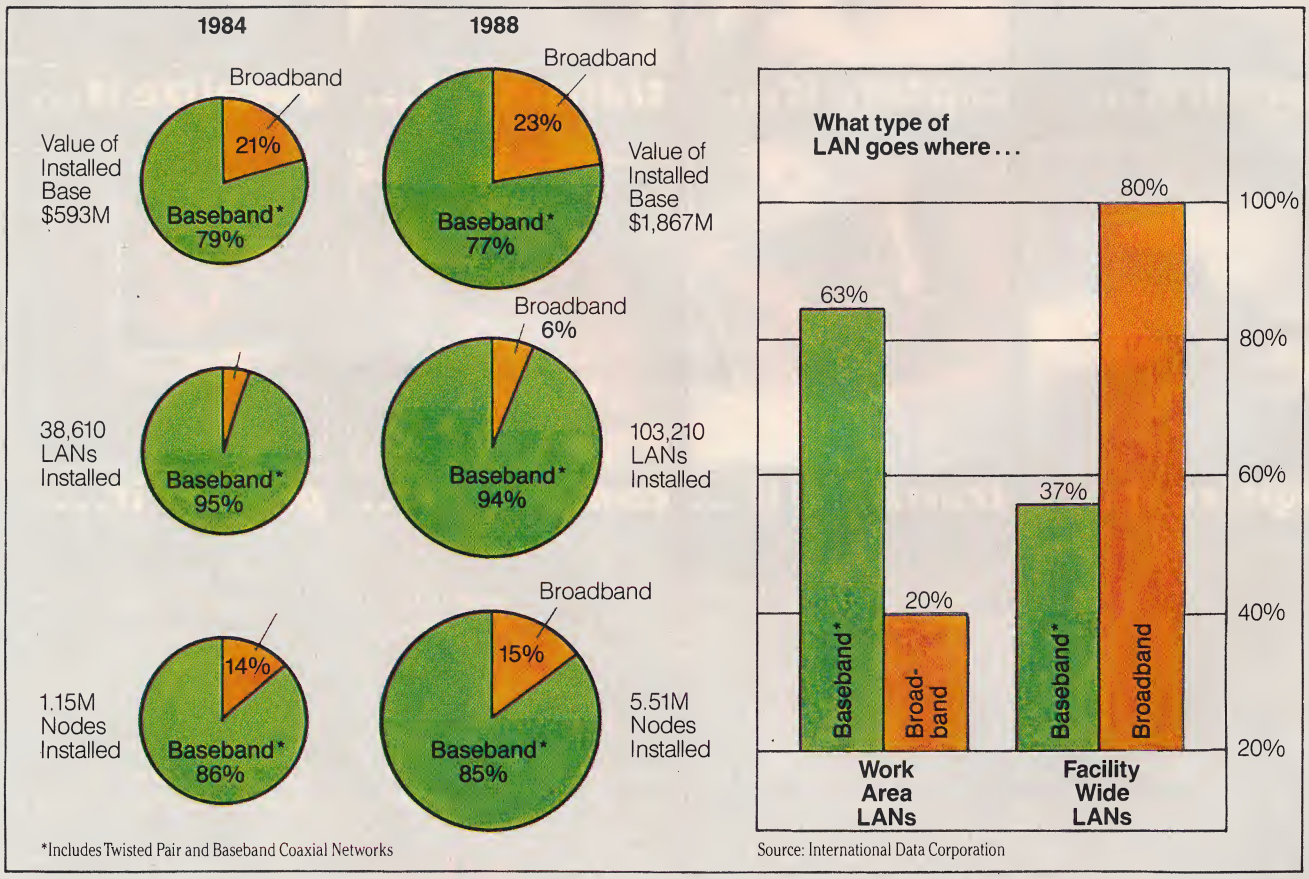
Facsimile

Businesses still need to quickly distribute pictures—"image data"—over a wide geographical range. And fax remains one of the most economical ways to get the job done, especially since the last few years have seen fax equipment prices fall even as new kinds of machines offer faster transmission rates and better copy resolution.

Indeed, high-speed digital facsimile (Group IV devices) will continue to benefit from better scanning and data compression techniques, and faster modems at lower cost—the result will be plummeting pricetags. By 1988, predicts International Data Corporation, these Group IV fax units will claim 17% of all facsimile shipments; in 1984, they'll constitute less than 1% of shipments.

THE BRAVE NEW WORLD OF LOCAL AREA NETWORKS

(Worldwide Installations Of U.S. Manufacturers, 1984–1988)



Slowed down by standards battles and high installation costs, local area nets are only beginning to make inroads as a data communications alternative, and the market will remain lopsided through the decade in favor of more limited (in both size and technology) work-area baseband systems.

Even so, the first eight years of LAN commercialization (1981 to 1988) will see network installations grow by 37% a year (compounded) and node installations climb 58% a year. The value of the LAN installed base, meanwhile, will increase 43% a year.

Too many communications systems are forced to take early retirement.

It's not that today's telephone systems can't do their jobs anymore. The problem is that they just can't *grow* with you; they don't adapt to today's rapidly changing voice/data technology and the changing needs of your firm.

Retirement should be a reward that comes after years of service. But too many systems that are over the hill today were brand new only yesterday.

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With the NEAX 2400 IMS you've always got the capabilities you need: without paying for more than you want today; without settling for less than you want tomorrow.

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Facsimile is getting lots of (indirect) media exposure these days, thanks to "Zap Mail," a new, heavily-advertised Federal Express service that uses NEC-designed Fax machines.

But "Zap Mail" has competition: eight-year-old Network Facsimile Services boasts 33 centers worldwide from which customers can send and receive faxed documents. "International and national businesses realize the cost advantages of transmitting documents via facsimile instead of conventional air or ground transport," comments the firm's president, Rudy Markmiller.

Meanwhile, vendors of facsimile equipment realize their future lies with automation—fax devices are being integrated into other systems. Burroughs, Wang, Datapoint, IBM, and Xerox all boast the beginnings of such fax integration.

"While just ten years ago, facsimile vendors marched to their own compatibility tunes," notes the president of Burroughs' imaging systems division, Marc Yanoff, "today's fax includes universal standards, reliable copy quality, fast transmission speeds, and the ability to communicate with computers, word processors, and telexes."

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INDEPENDENT NETS—HERE TO STAY

It was in the 1970s that a few entrepreneurial pioneers convinced the Federal Communications Commission that telecommunications was not an exclusive captive of the Bell monopoly.

Once the competitive seed was sown, it struggled to grow. Now—After Divestiture—alternative networks, though they account for a mere speck of the overall market, are in a state of hypergrowth. Since users must deal with *any* long distance communications service separately from local loop service, AT&T has lost its major advantage and the independent networks have a very bright future indeed.

MCI, the largest of the independents, will see 1984 revenues approach $1.5 billion. Now into international telecommunications and computer-generated mail services, the company is exploring new communications such as satellite, fiber optics, data termination services.

GTE's Sprint, launched along Southern Pacific Railroad's rights of way, now offers business and residential service nationwide and plans major expansion.

Allnet Communications Service, a 1980 arrival, is already the third largest reseller of telephone circuits.

A wide variety of more specialized networks have emerged, especially in the last couple of years, and more are developing on the horizon. Read on to find out about them and the technologies that make them work.

Cellular Radio

The only voice communications technology to spark high tech interest of late, cellular mobile telephone services have been inaugurated in Chicago, Baltimore, and Washington amidst a fury of user response. Chicago's Ameritech Mobile Phone Service signed up 5,000 subscribers during its first three months in 1983, and is adding new subscribers at a rate of 100 per day. Ameritech originally projected 7,000 users in the first 12 months.

A flood of FCC applications for wireline and nonwireline services—some 1,200 in the top 90 metropolitan areas—has resulted from vendors' anticipation of demand for cellular services. International Data Corporation sees the cellular phone market generating revenues of $28 million in 1984, climbing at 85% a year to $1.14 billion by 1990.

A combination of the high capitalization requirements of cellular services and expected price competition in mobile phone gear favors the heavy hitters, such as Motorola, and will serve to limit the number of competitors. It's no accident that every regional holding company has set up mobile phone subsidiaries and that independents are joining together for the sake of financial clout—some 28 joint ventures affecting 38 service areas were announced in the first quarter of 1984.

PRIVATE NETWORKS—THE BUSINESS OF BYPASS

In its simplest form, a private network is a system owned exclusively by its user. The idea is to transmit voice, data, and/or video over media that bypass all or most of the circuits of AT&T, the regional holding companies, and sometimes even the independents.

Such undertakings are, obviously, expensive—so the private network pioneers have tended to be large companies.

But The Divestiture and its ensuing costs and confusion—as well as variations on the original private network theme that contribute to their economic feasibility—have led medium-sized and even smaller organizations to drink at the private network well.

Both local and long haul communications are within the purview of private networks.

Met Nets

Technologically backward RHC local loops create transmission bottlenecks; local service comprises fully a third of the cost of a circuit and promises to cost even more as the effects of The Divestiture settle in.

Thus businesses develop their own metropolitan-area bypass services: branch office systems typically service bank branches, department stores, etc.; cluster networks, often using local area network technology, handle corporate headquarters campuses.

International Data Corporation estimates that by 1990 metropolitan bypass will total roughly four million lines—6% of the entire business market. Even now, nearly a quarter of the RHC's large business customers are bypassing.

The Long Haul

Large firms with extensive remote communications requirements are the likeliest candidates for privatizing their long haul transmissions. Virtues include control of one's own communications destiny (e.g.,

costs, upgrades) and a chance to employ advanced technology for faster and more accurate transmissions.

AT&T reports that 39% of its former large users in the Southwestern Bell territory now bypass, and another 17% are planning to; in Missouri, 54% are presently bypassing or have such plans, and in California, that figure stands at 45%. By the end of the century, estimates International Data Corporation, over 20,000 additional private networks will be operational.

Innovations in long haul private nets have resulted in their not being quite so private anymore.

Shared Networks. Where once only a tremendous communications traffic volume could justify the costs of bypass, it's now possible to buy into a portion of a system at reduced capacity and a lower pricetag.

This trend is taking two major directions. Satellite vendors are offering "virtual private networks" on which capacity is shared among several users. And owners of private nets are making their excess capacity available to outsiders.

Satellite-based shared network services include one from Isacomm (subsidiary of Northern Telecom), RCA Cylix, Satellite Business Systems' CNS B and Message I, American Satellite's SDX MetroLine and SVX shared user voice service.

Shared Tenant Networks. The idea of "intelligent buildings" has evolved from gleam-in-the-eye to reality. Developers can build in a long distance communication bypass during office building construction for a mere 1% increase in construction costs, with a payback period of less than two years. Hence small businesses, as tenants in such a building, take advantage of a private net.

"A business tenant," believes SBS President Stephen Schwartz, "should expect that, like his lighting and air conditioning, his telecommunications requirements will be met as a matter of course through the building's management."

A joint venture of Olympia and York and United Telecommunications has stepped into this shared tenant network market—for $100 million, office buildings in 40 cities will be linked via satellite, offering voice, video, and data transmission. Digital transmission will also be provided over long distance circuits purchased from common carriers and resold to tenants.

Building Systems, Inc.'s Data Highways service provides heat and light maintenance, security, and fire protection in addition to telecommunications and electronic office services.

PC SAYS SHALOM TO INTERRUPTIONS

"At the synagogue," complains Rabbi Jacob Izakson, "my working time is limited. There aren't enough hours and I'm constantly interrupted by the telephone."

Some things are indeed universal—including, perhaps, the rabbi's solution to his problem.

Congregation Ahavath Shalom bought a TRS-80 Model 16B personal computer, which hosts six Radio Shack DT-1 terminals, to prepare payroll, track synagogue membership and finances, and handle word processing jobs.

The rabbi put one terminal in his study at home, linked to the host TRS-80 via modem and phone line. "I can write memos to my staff and they'll be notified on their terminals," he says. "I also have access to the synagogue's database."

Not only can he write sermons in peace, but he can access a database of Jewish scholarship in New York—including the Talmud on tape. "It doesn't give the full text, just citations—but that's all I really need in preparing sermons."

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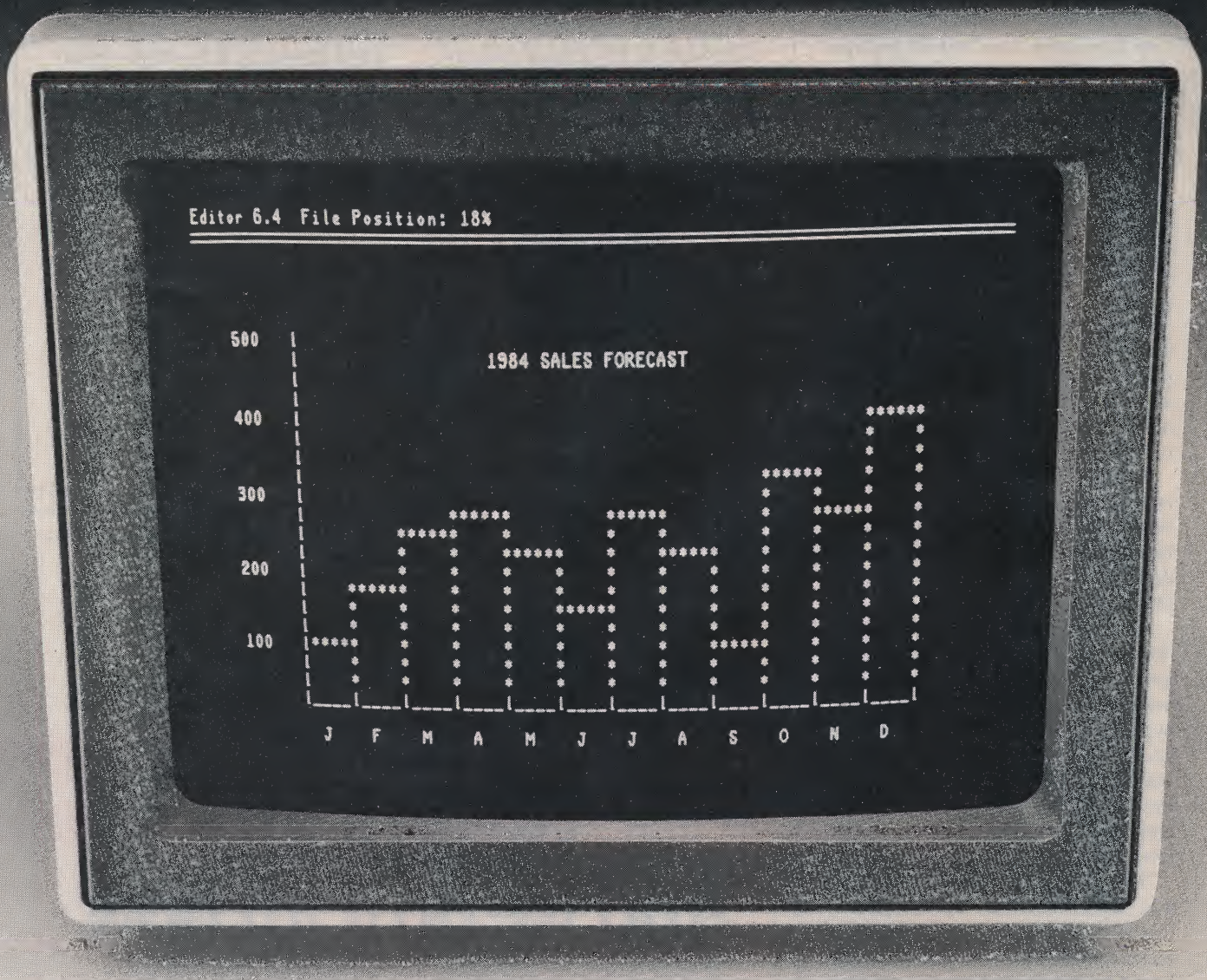

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Of course, the 3700 is backed by Burroughs' specially trained nationwide sales force and customer service organization.

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Others offering shared tenant network services include SBS RealCom, Lincoln Property Co., Trammel Crow Co.

Teleport. Big city congestion has inspired even further integration of real estate development and leading edge communications technology.

Scheduled for full operation this fall, Teleport is a Staten Island-based office park, a joint venture of Merrill Lynch, Western Union, and the Port Authority designed to offer a shared network for both local and long distance high-speed voice, data, and video communications.

It's comprised of over 17 earth stations for sending and receiving long haul transmissions via satellite and fiber optic cable local loops, including one that links Manhattan's World Trade Center. Teleport will be able to transmit 72,000 simultaneous voice messages or 180 full-color video channels. Users enjoy several options: universal access, shared access, private ownership of earth stations.

Teleport developers have plans to build similar nets in 30 cities, including Dallas, San Francisco, and London—and Teleport may become a telecommunications prototype.

BY-TECH

These so-called private networks are not technologically picky—microwave and satellites are perhaps used most often, but T1 carriers, fiber optics, and cable TV also have been employed. Often several technologies are integrated for the sake of cost and performance.

Microwave and Satellites

Perhaps no bypass approach is as entrenched as terrestrial microwave, which is a key ingredient in alternative long distance telephone services like that offered by pioneer MCI and GTE-Sprint.

Even more impressive, though, are satellites. Seemingly stationary in an orbit 22,300 miles over the equator, they bounce signals to and from earth stations on the ground. Some 17 satellites are circling up there now with no more than 400 transponders. By the end of 1987 there should be 38 birds aloft.

The bulk of transponder sales have been to cable and broadcast TV—a 46% excess transponder capacity registered by the FCC at the end of 1983 was felt mostly by those selling to large corporations.

Nevertheless, times are changing: the market for transponders in cable and broadcast TV is saturated, while opportunities in business communications are just yawning open. Several firms have developed business-oriented satellite services, such as shared networks, aimed at medium-sized and even small businesses.

Until recently, satellites have used the same frequency as ground-based microwave—so satellite earth stations had to be located well outside urban areas choked with microwave transmissions. That effectively bottlenecked their usefulness, since ground communications are so much slower.

But new satellites will be using a higher frequency, allowing them to transmit to earth stations in cities without interfering with microwave activity. Moreover, earth stations will be smaller and cheaper, so satellites will play a major bypass role.

Some leading computer industry vendors recognize this and are forging their place in the satellite services marketplace—IBM boosted its percentage of SBS, having bought out Comsat, and now jointly markets SBS offerings with its own.

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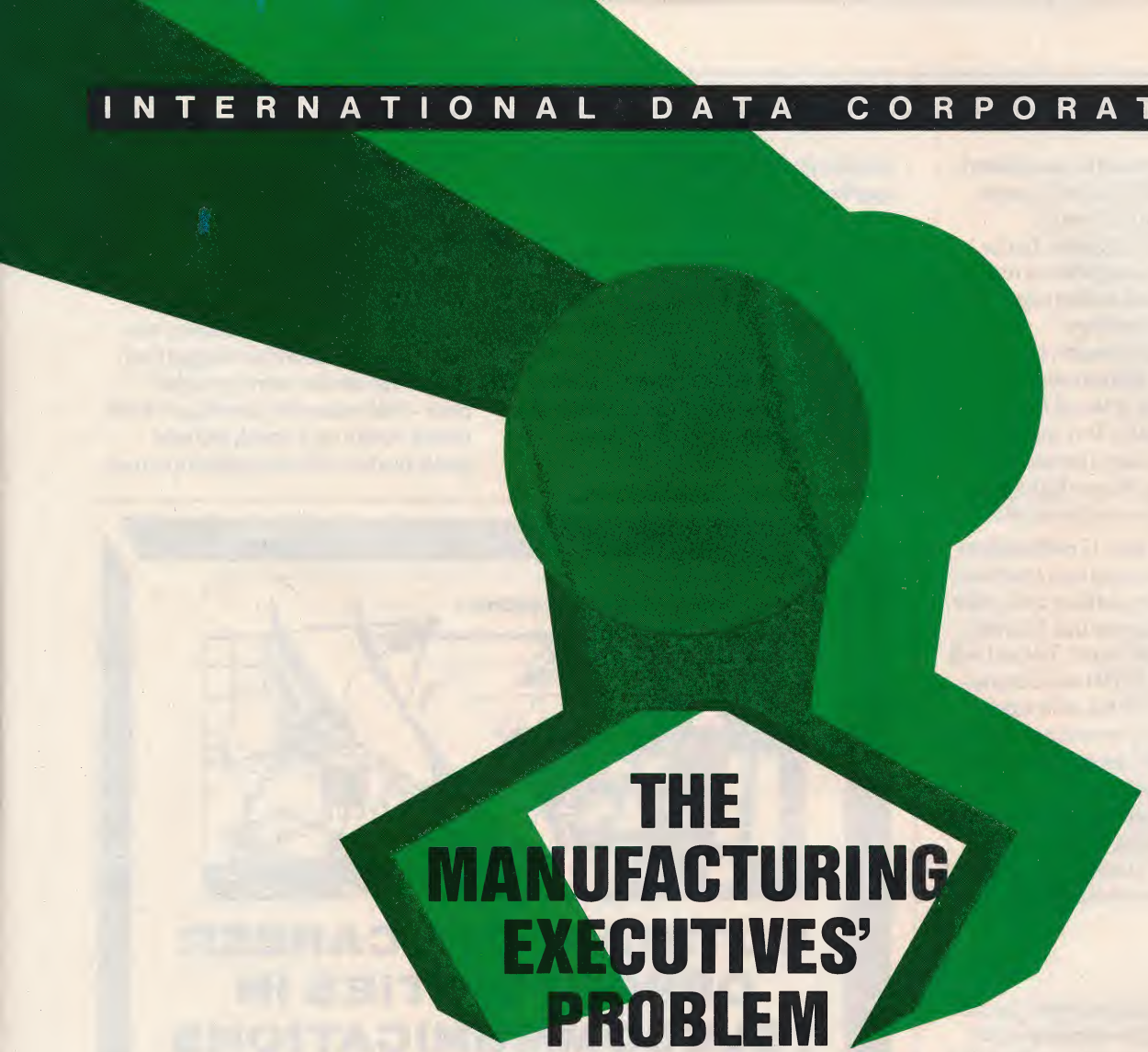

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INFORMATION MANAGEMENT IN THE '80s

Wang purchased 10% of U.S. Satellite Systems. Hewlett-Packard has tied in its 3000 series mainframe with Vitalink's service.

Tandem and American Satellite have developed an integrated, computer-controlled satellite net dubbed Infosat. And Mitel has launched a joint venture with American Satellite whereby switched private network services will be supported through Mitel's PBX products.

Fiber Optics

This once exotic and financially out-of-reach technology began in 1983 to achieve true commercial viability, thanks to technical breakthroughs that lowered costs and, of course, the demand for alternatives triggered by The Divestiture.

Not only have single-mode fiber optic cable prices dropped ten-fold since the late 1970s, but single-mode is also cheaper because it requires fewer signal repeaters—an important cost factor in using the technology for long haul communications.

International Data Corporation believes the U.S. fiber optic market will approach $400 million by yearend 1984, growing by 20% to 30% a year until the late 1980s when growth will increase, perhaps to 40% a year, as more and more local loop and local area networks employ the technology.

But U.S. vendors will face building competition from both onshore and offshore rivals. Merger/acquisition activity has brought Honeywell and Hewlett-Packard into the fiber optic fray, and foreign competitors include Sumitomo, Fujitsu, NEC, Siemens, and Cable & Wireless.

The T1 Carrier

A technology that claims a 30-year history, T1 is an all-digital, wideband channel based on pulse code modulation. It was first made commercially feasible by Bell Labs in the 1950s, but only in 1983 was T1 "retarriffed" by AT&T as Terrestrial Digital Circuits and offered to customers.

The beauty of the T1 carrier is manifold:

- Old telephone lines can be inexpensively upgraded to T1 status by installing signal repeaters at certain intervals,
- T1's wide bandwidth allows transmission of video and facsimile as well as voice and data,
- T1's transmission rate is not only cost-effective for high volumes of data traffic but it's also compatible with virtually every form of transmission—satellite, microwave, coax, fiber optics, cable.

Right now, T1 is used mostly in local area networks, but its appeal is broadening: MCI, Southern Pacific Communications, and Manhattan Cable are among

FAX SAVES BIG DOUGH FOR NABISCO

Sometimes company-wide networks don't have to be an executive-level capital expenditure.

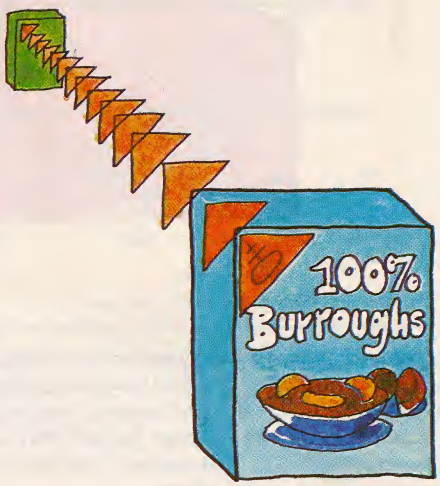
A hodgepodge of old, incompatible, and unreliable facsimile machines at Nabisco Brands, Inc. was costing the company too much money. It was obviously time to upgrade.

But rather than spend millions on a data communications network, Nabisco opted for better fax equipment, looking for such features as speed, copy quality, and confirmation of document receipt. Last May, 125 dex 3606 units from Burroughs Corp. were installed at vital corporate locations.

The machines are kept busy indeed—they regularly transmit financial data runs, sales orders, production and distribution reports, week- and month-end accounting runs, and communications updates. There's even a portable dex 1103 in the president's office for especially urgent transmissions.

Nabisco's senior telecommunications analyst, Glenn Overman, expects savings from the new fax machines to exceed $1 million over the next five years, thanks to their high speed transmission rate (9600 bps) and their compatibility with industry standards.

Now *that* is networking economy.



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those upgrading their existing facilities to T1. SBS integrates T1 into its CNS-B service, New York City's Teleport boasts T1 capacity, and Hughes Satellite will offer it. Given its versatility, T1's future role will likely be as a local-to-long haul interconnect.

NEXT PLEASE

With computing machines mushrooming up from every desktop and phones spawning like rabbits in such unlikely places as cars and briefcases, it's reasonable to be looking around for something that will link them all.

ISDN

That's Integrated Services Digital Networks. It's held pipedream status for several years now—after all, it *is* rather grandiose.

The vision: a planet-wide communications system in which all transmission—voice, data, image—would be digital; computers within the network would handle media conversion and control signaling, information storage, and configuration changes.

The possibilities: remote access from anywhere on earth, automatic translation between incompatible computing gear, permanent telephone numbers, teleconferencing without special facilities.

As pipedreams go, this one's pretty likely to wend its way into a fairly recognizable reality. The Divestiture and all of the chaos and impetus for new product and service development which it has inspired may well turn out to be ISDN's springboard.

The signs are encouraging, anyway. A couple of major telecommunications equipment suppliers, Rolm and Northern Telecom, have opened up their equipment access specifications—thus can other manufacturers build in connectivity. And gateways are being constructed by the likes of Western Union and ITT between their own services and others'.

So it begins. The first steps are usually the smallest. And the largest.

IDC

Text was prepared by International Data Corporation (IDC), Framingham, MA. Coordinated for IDC by Joseph Levy, managed by John Gantz. Text: Carol Weiszmann. Administration: Diane Testa. Graphics: Gael Burns. Production art: Joseph Clementi.

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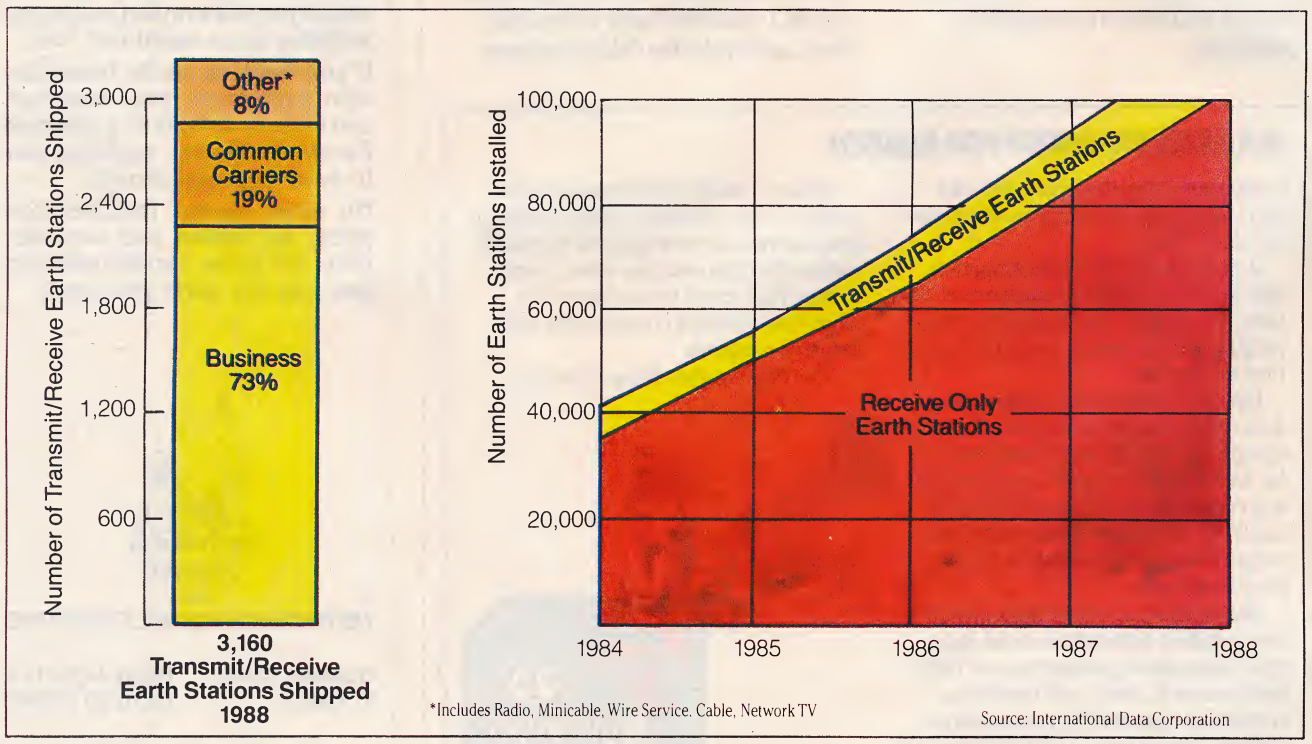

Despite today's excess transponder capacity with only 17 birds in the skies, the market for satellite-based business communications shows promise. New, high power satellites operating at bandwidths that don't interfere with city-bred terrestrial microwave and lower-cost earth stations will combine to offer an increasingly viable alternative to traditional communications paths—both long distance and local loop.

Most business communications, because it's two-way, will require transmit/receive earth stations. By 1988, business users will account for just 13% of all earth station shipments—only 4% of the receive only type, but nearly three-quarters of the transmit/receive variety.

DISTRIBUTED PROCESSING

The Race for the Desktop

There is a race on for the executive desktop. It's called distributed processing and it's the vanguard of a revolution in the way business does business.

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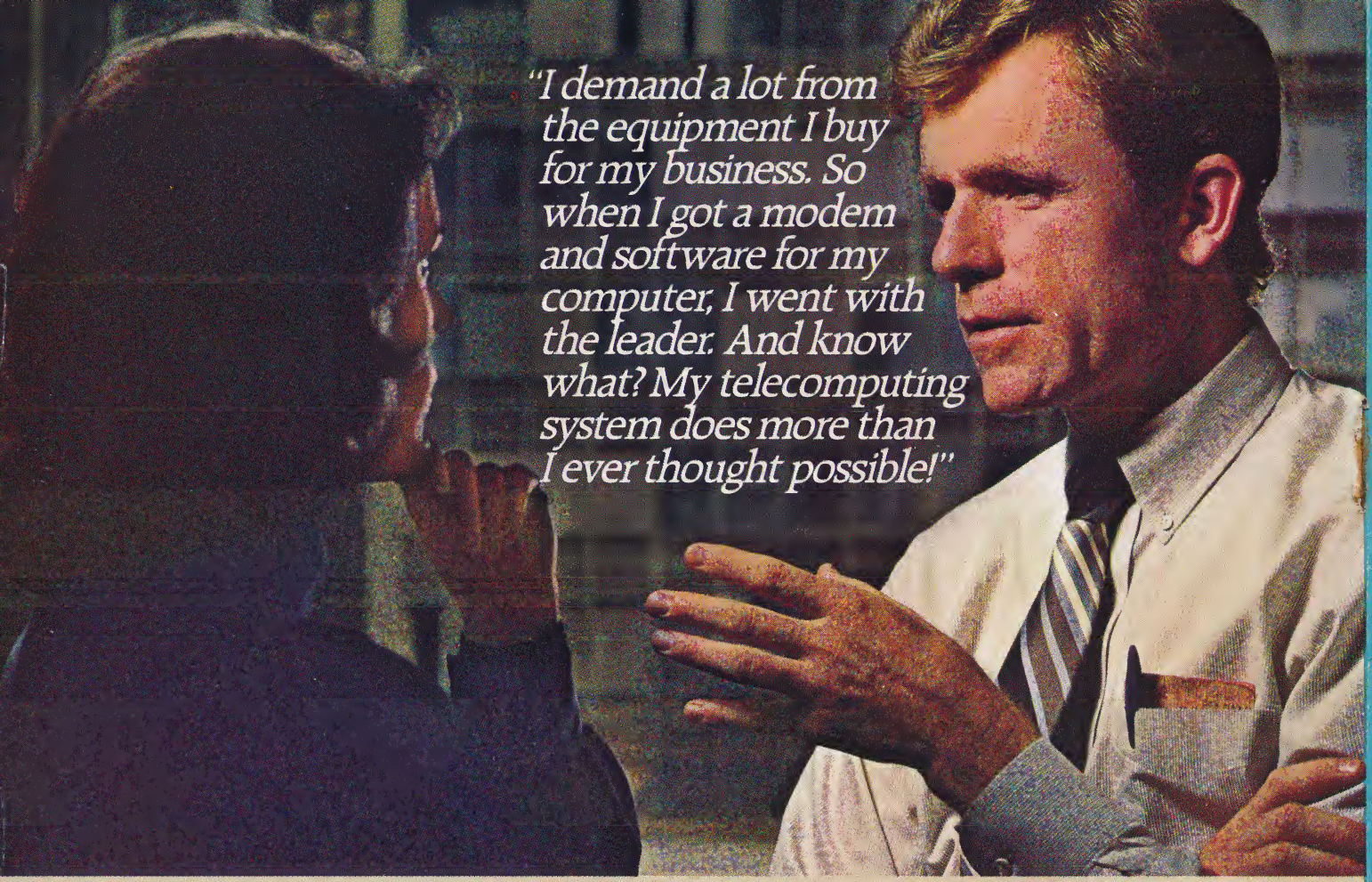

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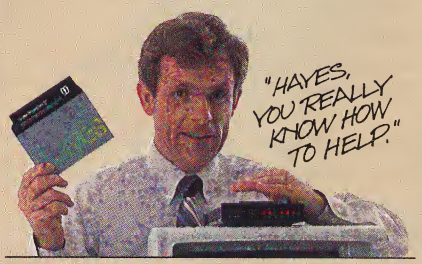

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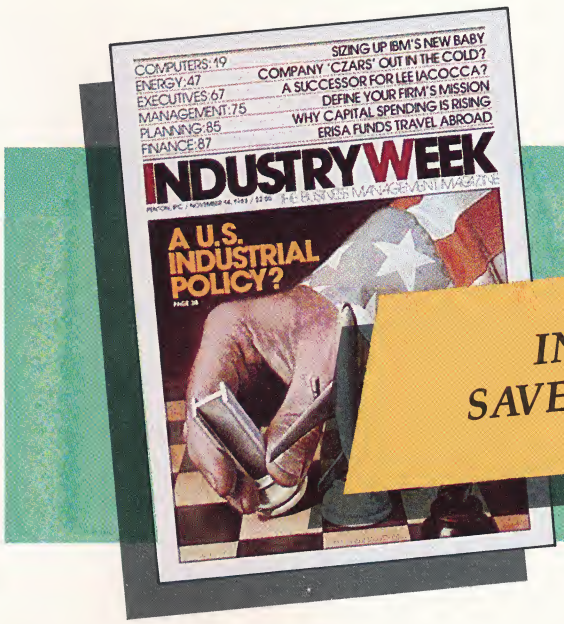

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